

### **REMARKS**

By this reply, claim 32 has been added, leaving claims 1, 2, 5-28, 31 and 32 pending in the application. The claim amendment does not add new matter. Favorable consideration is respectfully requested in light of the following remarks.

#### **Personal Interview**

Applicants thank Examiner Zimmerman for the courtesies extended to their undersigned representative during the personal interview conducted on March 30, 2006.

#### **Restriction Requirement**

Claims 11-31 stand withdrawn from consideration as being drawn to non-elected subject matter. Claim 11, which is directed to a method of producing a sprocket, recites each of the features recited in claim 1, which is directed to a sprocket. According to M.P.E.P. § 821.04(b), once claim 1 is found to be allowable, claim 11, and claims 12-28 and 31 depending from claim 1, should be considered for rejoinder.

#### **Obviousness-Type Double Patenting Rejections**

Claims 1, 2 and 5-10 stand rejected under the doctrine of obviousness-type double patenting over claims 1-9, 15-22 and 27-32 of co-pending U.S. Application No. 10/171,193.

Applicants will reconsider the submission of a Terminal Disclaimer to obviate this rejection upon the indication of allowable subject matter in this application.

**First Rejection Under 35 U.S.C. §103**

Claims 1, 2 and 5-10 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,414,258 to Amano in view of U.S. Patent No. U.S. Patent No. 5,879,743 to Revankar and U.S. Patent No. 2,271,172 to Heaslet. The rejection is respectfully traversed.

Claim 1 recites a sprocket comprising, *inter alia*, a base steel member comprising an outer toothed profile surface, at least a portion of the outer toothed profile surface having a wear and corrosion resistant coating disposed thereon; the base steel member comprises a surface hardened zone extending inwardly from the outer toothed profile surface, and wherein the surface hardened zone is induction hardened. Amano fails to disclose or suggest a sprocket comprising a base steel member having a wear and corrosion resistant coating as recited in claim 1 on an outer toothed profile surface of the base steel member.

The Office Action asserts that Amano discloses that “the articles can be subjected to induction hardening.” As was discussed during the personal interview, Amano discloses that the inner peripheral surface of a bushing can be induction heated while the outer peripheral surface of the bushing is cooled. See, e.g., column 10, lines 30-36 and 45-52; and column 20, lines 31-58. Amano does not, however, disclose or suggest induction hardening a sprocket, much less a sprocket comprising a base steel member having an induction hardened, surface hardened zone extending inwardly from an outer toothed profile surface.

Amano discloses forming a weld overlay on bushings and on sprockets that engage with the bushings. Amano does not disclose or suggest induction hardening

of the weld overlay portion of the bushing, or the sprocket. Amano discloses that cracks develop on the weld beads during overlay of sprockets. Amano discloses precautions that are taken to reduce cracking during the weld overlay formation and to prevent cracks from expanding or extending during service. See column 3, lines 42-51; column 7, lines 42-53, and column 15, lines 12-18 regarding sprockets; and column 5, lines 46-49, for bushings. According to Amano's disclosure, the weld overlay process produces cracks. Amano discloses heating of the bushings after the overlay is formed for gas carburizing and subsequent reheating, quenching and tempering in order to obtain higher hardness in the surface areas of the bushing without an overlay. See, e.g., column 9, lines 46-48, of Amano.

Applicants submit that the heating of Amano's parts with an overlay in a furnace provides a much slower heating rate of the surface with the overlay, and is performed to minimize the risk of propagation of already-existing cracks (i.e., cracks formed during the weld overlay process).

In contrast to such slow furnace heating techniques, typical induction heating rates in a production environment can exceed 1000°C/s, depending on various factors, such as the material that is heated, degree of inductor coil coupling, and power input to the coil. Applicants submit that high heating rates associated with Induction hardening can aggravate previously-existing cracks in the weld overlay, which can result in loss of the weld overlay and further propagation of cracks through the weld material. Aggravation of cracks in the weld overlay also can arise due to the differing coefficients of thermal expansion of the base metal and the weld metal, which are joined and heated at a rapid rate during induction heating.

Applicants also submit that Amano's sprocket material contains enough carbon and manganese in addition to some boron to make it reasonable to heat treat the sprocket base material, which is done before the weld overlay step and not after it. While heat treatment before overlay strengthens the sprocket, the hardened sprocket material layer at the weld interface would soften during overlay and would not add to wear life beyond what the weld overlay would provide. In the claimed sprocket, induction heat treating performed after the coating is fused can further improve wear life.

In the claimed sprocket, the inner peripheral surface does not need to be induction hardened because this surface is not subjected to direct wear and thus a high inner peripheral surface hardness is not preferable. The sprocket segment (or a full circle sprocket) can be heat treated after the wear coating is fused for improved strength characteristics, which can also increase the hardness of the inner periphery. In the claimed sprocket, the surface that engages with the bushing can be induction hardened without adversely affecting the coating/base metal joint or the fused coating performance.

For the foregoing reasons, Amano does not suggest that it would have been desirable to induction harden the sprocket, much less that the sprocket would even have an acceptable structure or properties if it were induction hardened.

Accordingly, because the combination of Amano, Revanker and Heaslet does not disclose or suggest each and every feature recited in claim 1, the applied references do not support a *prima facie* case of obviousness. See M.P.E.P. § 2143.03. Therefore, claim 1 is patentable.

Claims 2 and 5-10, which depend from claim 1, are also patentable for at least the same reasons as those discussed with respect to claim 1. Therefore, withdrawal of the rejection is respectfully requested.

### **Second Rejection Under 35 U.S.C. §103**

Claims 1, 2 and 5-10 stand rejected under 35 U.S.C. § 103(a) over Revankar in view of "applicant's disclosure of the prior art" and Amano. The rejection is respectfully traversed.

As discussed above, Amano does not suggest a sprocket comprising a base steel member having an induction hardened, surface hardened zone extending inwardly from an outer toothed profile surface. Accordingly, the sprocket recited in claim 1 is patentable over the applied art for at least this reason.

Dependent claims 2 and 5-10 are also patentable for at least the same reasons as those discussed with respect to claim 1. Therefore, withdrawal of the rejection is respectfully requested.

### **New Claim**

New independent claim 32 recites a sprocket comprising, *inter alia*, a base steel member comprising an inner peripheral surface and an outer toothed profile surface, at least a portion of the outer toothed profile surface having a wear and corrosion resistant coating disposed thereon; wherein the base steel member comprises a surface hardened zone which is formed by induction hardening the base steel member having the coating thereon such that the surface hardened zone

extends inwardly from the outer toothed profile surface to a depth spaced from the inner peripheral surface. Applicants submit that claim 32 is also patentable.


**Conclusion**

For the foregoing reasons, allowance of the application is respectfully requested. Should the Examiner have any questions concerning this response, Applicants' undersigned representative can be reached at the number given below.

Respectfully submitted,

BUCHANAN INGERSOLL PC (INCLUDING ATTORNEYS FROM  
BURNS DOANE SWECKER & MATHIS)

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By:   
Edward A. Brown  
Registration No. 35,033

P.O. Box 1404  
Alexandria, Virginia 22313-1404  
(703) 836-6620